

PATENT COOPERATION TREATY
PCT
INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)
(PCT Article 36 and Rule 70)

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| Applicant's or agent's file reference P22818PCAU | FOR FURTHER ACTION | See Form PCT/IPEA/416 |
| International application No. PCT/AU2004/000858 | International filing date (day/month/year) 28 June 2004 | Priority date (day/month/year) 27 June 2003 |
| International Patent Classification (IPC) or national classification and IPC Int. Cl. ⁷ G10H 3/18 | | |
| Applicant AUSTRALIAN NATIVE MUSICAL INSTRUMENTS PTY LTD et al | | |

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of **5** sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

a. ☒ (sent to the applicant and to the International Bureau) a total of **5** sheets, as follows:

☒ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒ Box No. I Basis of the report

☐ Box No. II Priority

☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

☐ Box No. IV Lack of unity of invention

☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

☒ Box No. VI Certain documents cited

☐ Box No. VII Certain defects in the international application

☐ Box No. VIII Certain observations on the international application

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|---|---|
| Date of submission of the demand 22 April 2005 | Date of completion of the report 13 May 2005 |
| Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929 | Authorized Officer J.W. THOMSON Telephone No. (02) 6283 2214 |

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/AU2004/000858

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language
which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1 (b))

☐ publication of the international application (under Rule 12.4)

☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages 1 - 3, 5, 6, 8 - 10 as originally filed/furnished

pages* 4, 7 received by this Authority on 22 April 2005

pages* received by this Authority on with the letter of

☒ the claims:

pages as originally filed/furnished

pages* as amended (together with any statement) under Article 19

pages* 11 - 13 received by this Authority on 22 April 2005

pages* received by this Authority on with the letter of

☒ the drawings:

pages 1/3 - 3/3 as originally filed/furnished

pages* received by this Authority on with the letter of

pages* received by this Authority on with the letter of

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/figs

☐ the sequence listing (*specify*):

☐ any table(s) related to the sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/figs

☐ the sequence listing (*specify*):

☐ any table(s) related to the sequence listing (*specify*):

* If item 4 applies, some or all of those sheets may be marked "superseded."

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

| | | |
|-------------------------------|---------------|-----|
| Novelty (N) | Claims 1 – 20 | YES |
| | Claims | NO |
| Inventive step (IS) | Claims 1 – 20 | YES |
| | Claims | NO |
| Industrial applicability (IA) | Claims 1 - 20 | YES |
| | Claims | NO |

2. Citations and explanations (Rule 70.7)

- D1: US-6111186-A (Krozack et al.) 29 August 2000
D2: US-5817966-A (Fishman) 6 October 1998
D3: US-4501186-A (Ikuma) 26 February 1985
D4: US-4913024-A (Carriveau) 3 April 1990
D5: US-5723804-A (Replogle) 3 March 1998
D6: Non-patent literature: B-Band web site http://www.b-band.com/product_a4.2.shtml & http://web.archive.org/web/20030701152423/www.b-band.com/product_a4.shtml, 24 June 2003

Document D1:

The invention defined in claims 1 to 20 of the present application is novel and inventive over the prior art document D1.

Document D1 does not teach or suggest a mixing circuit as defined in claim 1 of the present invention. In particular, D1 does not disclose or suggest "a device for mixing the outputs of two sensors" within which there is a "control means for varying the first frequency", wherein said first frequency is that of "a low pass filter for passing signal components of the first input signal below a first frequency", and wherein said first input is that of "a first input for receiving a signal from at least one first sensor."

D1 disclose low pass filters, high pass filters, equalisation components and mixing circuits in Figures 5, 6, 7 and 9, and respective descriptions, but D1 does not teach or suggest "a control means for varying the ... frequency" in relation to any of said filtering, mixing or equalisation components.

Document D2:

The invention defined in claims 1 to 20 of the present application is novel and inventive over the prior art document D2.

Citation D2 discloses a signal processing circuit in which the signals of a first and a second piezoelectric transducer are combined using components including a low pass filter, a high pass filter and a mixer as describe in column 12, lines 33 to 48 in association with Figure 21 of D2. However, D2 does not teach or suggest "a control means for varying the ... frequency" in relation to any of said filtering or mixing components.

Box No. VI Certain documents cited

1. Certain published documents (Rule 70.10)

| <u>Application No.</u> <u>Patent No.</u> | <u>Publication date</u> <u>(day/month/year)</u> | <u>Filing date</u> <u>(day/month/year)</u> | <u>Priority date (valid claim)</u> <u>(day/month/year)</u> |
|---|--|---|--|
| US-6627808-B1 | 30 September 2003 | 3 September 2002 | 3 September 2002 |

The citation US-6627808-B1 discloses some of the essential features as claimed in the present application. In particular an apparatus and method of modelling an acoustic sound for use on an electric guitar is taught. The apparatus consists of two sensors, a bridge sensor, a body sensor and pre-amplification circuitry. The citation fails to anticipate all essential features of the present claims in that tonal filtering or equalisation is provided for only one sensor, the bridge sensor, but not for both sensors as disclosed in the present application.

However, citation US-6627808-B1 does not teach or suggest "a control means for varying the ... frequency" in relation to any of said filtering, equalisation or amplification features.

Claims 1 to 20 of the present application are novel and inventive over the prior art document US-6627808-B1 and citation D2 when read in combination.

2. Non-written disclosures (Rule 70.9)

| <u>Kind of non-written disclosure</u> | <u>Date of non-written disclosure</u> <u>(day/month/year)</u> | <u>Date of written disclosure</u> <u>referring to non-written disclosure</u> <u>(day/month/year)</u> |
|---------------------------------------|--|--|
| <hr/> | <hr/> | <hr/> |

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: **Box V**

Documents D2 and D3:

The invention defined in claims 1 to 20 of the present application is inventive over the prior art D2 and D3 when read in combination.

Citation D2 discloses a system in which the output signals of two transducers associated with a musical instrument are combined using various filtering components and a mixer as described in column 12, lines 33 to 48 in association with Figure 21. Citation D3 discloses a system in which two transducers are affixed at different locates on an acoustic guitar for which the output signals are mixed in a suitable ratio as described in column 3, lines 39 to 68 and column 4, lines 1 to 6. Reference is made also to Figures 6, 7, and 8 of D3.

However, the invention defined in claims 1 to 20 of the present application is inventive over the prior art documents D2 and D3 when read in combination in that D2 and D3 do not teach or suggest "a control means for varying the ... frequency" in relation to any of said filtering or mixing components.

Documents D4 to D6:

The invention defined in claims 1 to 20 of the present application is novel and inventive over the prior art D4 to D6 when read individually or in combination.

Documents D4 to D6 provide background art relevant to the present invention but do not disclose all the essential features claimed in the present application. Documents D4 to D6 do not teach or suggest the claimed invention in entirety but disclose only selected essential features of the present claims.

Documents D4 to D6 do not teach or suggest "a control means for varying the ... frequency" in relation to any of the disclosed technological features including filtering, mixing or equalisation components.

taken from an under saddle sensor and higher frequencies are taken from a sensor situated on the soundboard or face of the instrument.

This outcome has been achieved in this embodiment by filtering, or "rolling off", the higher frequencies from the under saddle sensor(s) and, conversely, filtering the lower frequencies from the soundboard sensor so that only the "top end", or frequencies not produced by the under saddle sensor, are transmitted. Thus, the under saddle sensor produces the lower, or "bottom end", frequencies whilst the soundboard sensor produces the higher, or "top end", frequencies. A suitable crossover circuit may be employed to mix the two frequency ranges to produce a uniform combined frequency response.

One aspect of the invention accordingly provides a device for mixing the outputs of two sensors including:

- a first input for receiving a signal from at least one first sensor;
- a second input for receiving a signal from at least one second sensor;
- a low pass filter for passing signal components of the first input signal below a first frequency;
- a high pass filter for passing signal components of the second input signal above a second frequency;
- a mixing circuit for combining the signals passed by the low pass filter and the high pass filter to form a combined output signal; and
- control means for varying the first frequency.

The first frequency may define the corner frequency of the low pass filter and the second frequency may define the corner frequency of the high pass filter. There may therefore exist a crossover between the input signals from the first and second sensors at a crossover frequency determined by the corner frequencies of the two filters. The first and second corner frequencies are preferably selected to provide a substantially uniform overall response in the combined output signal.

The device includes a control means for varying the first frequency, i.e. the corner frequency of the low pass filter. Preferably, the variable first frequency has a minimum value substantially equal to the second frequency, i.e. the corner frequency of the high pass filter. The minimum value of the first frequency is preferably set within the range of 300 Hz to 900 Hz and most preferably at about 750 Hz, although any alternative frequency may be selected.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring now to Figure 1, there is shown a system 10 for recording or amplifying a stringed instrument such as an acoustic guitar 12. The system includes a first input for an under saddle sensor 14 (which may be of a conventional type) connected to a buffer and pre-emphasis circuit 16. The circuit 16 also provides, in this embodiment, power gain and low frequency filtering below about 60 Hz. The signal is then fed to a variable frequency low pass filter 18, the corner frequency of which is preferably variable between about 720 Hz and 10 kHz. The minimum corner frequency of the low pass filter 18 corresponds to a fixed corner frequency of the high pass filter 24 described below. The output of the low pass filter 18 is then fed to a mixing circuit 20.

The system also includes a second input for a soundboard sensor 22 connected to a high pass filter 24. In this embodiment the high pass filter 24 also includes a buffer, power gain and pre-emphasis circuit. In this embodiment the high pass filter 24 has a fixed corner frequency of about 720 Hz, corresponding to the minimum corner frequency of the low pass filter 18. The lowest crossover frequency between the sensors 22,14 connected to the high pass filter 24 and low pass filter 18 is therefore 720 Hz in this instance. When the corner frequency of the low pass filter 18 is increased, the effective crossover frequency between the two sensors is increased. A passive treble roll-off filter 26 may also be provided to restrict the highest frequency passed to the mixer 20.

A control means in the form of a dual gang potentiometer 28 is provided to control the blend of signals from the under saddle sensor 14 and soundboard sensor 22. The potentiometer may be of a rotary type or of a linear slider type, as is often used for electric guitar tone controls. In this instance, the dual gang potentiometer 28 includes two elements 28' and 28" to simultaneously control the corner frequency of the low pass filter 18 and the level of the signal from the high pass filter 24.

The system shown in Figure 1 also includes tone controls 30 including bass, mid and treble controls, however tone controls optional. Similarly, a gain control 32 is shown in Figure 1 but, once again, this control is not essential. The output signal is then provided to an output jack 34 which typically would be provided in a side wall of the guitar.

CLAIMS:

1. A device for mixing the outputs of two sensors including:
 - a first input for receiving a signal from at least one first sensor;
 - a second input for receiving a signal from at least one second sensor;
 - 5 a low pass filter for passing signal components of the first input signal below a first frequency;
 - a high pass filter for passing signal components of the second input signal above a second frequency;
 - a mixing circuit for combining the signals passed by the low pass filter and
 - 10 the high pass filter to form a combined output signal; and
 - control means for varying the first frequency.
2. A device according to claim 1 wherein the first frequency defines a corner frequency of the low pass filter and the second frequency defines a corner frequency of the high pass filter.
- 15 3. A device according to claim 2 wherein there exists a crossover between the input signals from the first and second sensors at a crossover frequency determined by the corner frequencies of the two filters.
4. A device according to claim 3 wherein the first and second corner frequencies are selected to provide a substantially uniform overall response in the
- 20 combined output signal.
5. A device according to claim 4 wherein the variable first frequency has a minimum value substantially equal to the second frequency.
6. A device according to claim 5 wherein the first frequency has a minimum value within the range of 300 Hz to 900 Hz.
- 25 7. A device according to claim 6 wherein the minimum value is about 750Hz.

8. A device according to claim 6 or claim 7 wherein the first frequency is variable between the minimum value and about 10 kHz.
9. A device according to any one of claims 4 to 8 wherein the control means further includes an attenuator for varying a level of the signal passed by the high pass filter from the second input to the mixing circuit.
10. A device according to claim 9 wherein the control means simultaneously varies the first frequency of the low pass filter and varies the level of the signal passed by the high pass filter.
11. A device according to claim 10 wherein a range of frequencies passed by the low pass filter is extended whilst the level of the signal passed by the high pass filter is attenuated, and the range of frequencies passed by the low pass filter is reduced whilst the level of the signal passed by the high pass filter is increased.
12. A device according to any one of the preceding claims wherein the second frequency is within the range of 300 Hz to 900 Hz.
13. A device according to claim 12 wherein the second frequency is about 750Hz.
14. A pre-amplifier incorporating a mixing device according to any one of the preceding claims.
15. A pre-amplifier according to claim 14 wherein an under saddle sensor is connectable to the first input of the mixing device and a second sensor, attached to a body portion of the guitar, is connectable to the second input of the mixing device.
16. A pre-amplifier according to claim 15 wherein the second sensor is attached to the inside of the soundboard of the guitar.

17. An acoustic guitar including an under saddle sensor, a second sensor attached to a body portion of the guitar and a pre-amplifier according to any one of claims 14 to 16, wherein the under saddle sensor is connected to the first input of the mixing device and the second sensor is connected to the second input of
5 the mixing device.

18. An acoustic guitar according to claim 17 wherein the second sensor is attached to the inside of the soundboard of the guitar.

19. An acoustic guitar according to claim 17 or claim 18 wherein a further sensor is attached to another body portion of the guitar and is also connected to
10 the second input of the mixing device.

20. An acoustic guitar according to claim 19 wherein the second sensor is attached to the soundboard of the guitar and the further sensor is attached to the rear panel of the guitar.